

Comparative ultrastructure of green protozoa with intracellular symbiotic *Chlorella*

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SUMMARY

Freshwater environments include many species of animals and protozoans with intracellular symbiotic *Chlorella*. To compare the ultrastructure of symbiotic *Chlorella* of various host organisms, green (symbiotic) strain of *Mayorella* sp., green *Stentor* sp. (Biwako strain), *Paramecium bursaria* (Kobe strain), and *Hydra viridis* (Minami-Daito strain) were fixed by freeze-substitution and were then observed using a transmission electron microscope. In all organisms, the cell walls of the symbionts were closely apposed to the inner surface of the peri-algal vacuole (PV) membrane with a narrow and constant distance of 25–50 nm. Outer membranes of the host's mitochondria were frequently and consistently observed to be firmly attached, and sometimes fused, with the PV membrane in all host organisms. Aside from these common ultrastructural characteristics, cell walls of the symbiotic *Chlorella* in *P. bursaria* possessed a layer of fluffy structures, while those in green *Stentor* sp. and *H. viridis* appeared smooth. The symbiotic *Chlorella* of *P. bursaria* and green *Mayorella* sp. had a pyrenoid in their chloroplasts, while those of green *Stentor* sp. and *H. viridis* did not. These differences suggest a possible wide genetic variety of *Chlorella* among different symbiotic organisms.